

Claims

What is claimed is:

Claim 1. A method for converting a vertically structured CAD/CAM model to a horizontally structured CAD/CAM model, comprising:

identifying and establishing a base feature;

establishing a parent coordinate system;

identifying a parent modeling element;

identifying each dependency for each feature from said parent modeling element;

restructuring each dependency for each said feature for placement, such that each feature exhibits a direct associative relationship with a reference feature; and

restructuring each dependency for each said feature for positioning, such that each feature exhibits a direct associative relationship with another reference feature.

Claim 2. The method of Claim 1 wherein said reference feature includes:

said parent coordinate system,

a child coordinate system exhibiting an associative relationship with said parent coordinate system,

a first datum exhibiting an associative relationship with at least one of said parent coordinate system and said child coordinate system, and

a second datum exhibiting an associative relationship with said first datum.

Claim 3. The method of Claim 1 wherein said another reference feature includes:

said parent coordinate system,

said child coordinate system exhibiting an associative relationship with said parent coordinate system,

a third datum exhibiting an associative relationship with at least one of said parent coordinate system and said child coordinate system, and

a fourth datum exhibiting an associative relationship with said third datum.

Claim 4. The method of Claim 1 further including identifying a primitive element in said vertically structured CAD/CAM model.

Claim 5. The method of Claim 4 further including converting said primitive element to a feature.

Claim 6. The method of Claim 5 wherein said converting includes establishing a new feature corresponding to said primitive element such that said new feature exhibits an associative relationship with at least one of said parent coordinate system and a child thereof for placement and positioning; and such that said new feature; exhibits an associative relationship with at least one of said parent coordinate system and a child thereof for positioning.

Claim 7. The method of Claim 6 wherein said associative relationship is a parent/child relationship.

Claim 8. The method of Claim 1 wherein said base feature corresponds to a selected primitive element in said vertically structured CAD/CAM model.

Claim 9. The method of Claim 1 wherein said establishing said parent coordinate system comprises:

creating a first datum plane positioned and oriented relative to a reference;

creating a second datum plane positioned and oriented relative to said reference; and

creating a third datum plane positioned and oriented relative to said reference.

Claim 10. The method of Claim 6 wherein said first datum plane, said second datum plane, and said third datum plane are orthogonal.

Claim 11. The method of Claim 1 wherein said feature dependent from said parent modeling element exhibits a parent child relationship with at least one of said parent modeling element and a descendent thereof such that positioning and placement of said dependent features is relative to said at least one of said parent modeling element and said descendent thereof.

Claim 12. The method of Claim 11 wherein at least one of said associative relationship and said another associative relationship is a parent/child relationship.

Claim 13. The method of Claim 1 wherein said restructuring each dependency for each said feature for placement further includes:

determining if said feature is dependent on an existing datum for placement;

if said feature is dependent on an existing datum for placement, then at least one of:

configuring a new reference feature for placement of said feature wherein said reference feature is a descendent of said parent coordinate system and establishing an associative relationship between said feature and said new reference feature, then deleting said dependency,

reconfiguring said existing datum as a descendant of said parent coordinate system; and

establishing an associative relationship with at least one of said parent coordinate system and a descendent reference feature therefrom and deleting said dependency.

Claim 14. The method of Claim 13 wherein said associative relationship is a parent/child relationship.

Claim 15. The method of Claim 1 wherein said restructuring each dependency for each said feature for positioning further includes:

determining if said feature is dependent on at least one existing datum for positioning;

if said feature is dependent on said at least one existing datum for positioning, then at least one of:

configuring a new reference feature for positioning of said feature wherein said reference feature is a descendent of said parent coordinate system and establishing an associative relationship between said feature and said new reference feature, then deleting said dependency,

reconfiguring said at least one existing datum as a descendant of said parent coordinate system;

establishing an associative relationship with at least one of said parent coordinate system and a descendent reference feature therefrom and deleting said dependency.

Claim 16. The method of Claim 15 wherein said associative relationship is a parent/child relationship.

Claim 17. The method of Claim 1 wherein none of said features exhibits an associative relationship with any other feature.

Claim 18. The method of Claim 1 wherein none of said features exhibits an associative relationship with said base feature.

Claim 19. The method of Claim 1 wherein said base feature exhibits an associative relationship with at least one of said coordinate system and a descendent thereof.

Claim 20. The method of Claim 1 wherein a descendent of said coordinate system includes at least one of a reference, point, line, datum plane and another coordinate system positioned and oriented relative to said coordinate system.

Claim 21. A horizontally structured CAD/CAM model, comprising:

a reference feature;

a base feature;

a feature;

wherein said model is converted from a vertically structured CAD/CAM model by restructuring each dependency for each said feature for placement, such that each feature exhibits a direct associative relationship with said reference feature, and restructuring each dependency for each said feature for positioning, such that each feature exhibits a direct associative relationship with another reference feature.

Claim 22. The system of Claim 21 wherein said reference feature includes:

a parent coordinate system,

a child coordinate system exhibiting an associative relationship with said parent coordinate system,

a first datum exhibiting an associative relationship with at least one of said parent coordinate system and said child coordinate system, and

a second datum exhibiting an associative relationship with said first datum.

Claim 23. The system of Claim 21 wherein said another reference feature includes:

a parent coordinate system,

a child coordinate system exhibiting an associative relationship with said parent coordinate system,

a third datum exhibiting an associative relationship with at least one of said parent coordinate system and said child coordinate system, and

a fourth datum exhibiting an associative relationship with said third datum.

Claim 24. The model of Claim 21 wherein at least one of said associative relationship and said another associative relationship is a parent/child relationship.

Claim 25. The model of Claim 21 wherein said feature exhibits an associative relationship with said base feature.

Claim 26. The model of Claim 21 wherein said base feature exhibits an associative relationship with at least one of said reference feature and a descendant thereof.

Claim 27. The system of Claim 1 further including identifying a primitive element in said vertically structured CAD/CAM model.

Claim 28. The system of Claim 27 further including a new feature established by converting said primitive element to a feature corresponding to said primitive element such that said new feature exhibits an associative relationship with at least one of said parent coordinate system and a child thereof for placement and positioning; and such that said new feature; exhibits an associative relationship with at least one of said parent coordinate system and a child thereof for positioning.

Claim 29. The system of Claim 28 wherein said associative relationship is a parent/child relationship.

Claim 30. The system of Claim 21 wherein said base feature corresponds to a selected primitive element in said vertically structured CAD/CAM model.

Claim 31. The model of Claim 21 wherein said reference feature comprises a coordinate system.

Claim 32. The model of Claim 31 wherein said coordinate system comprises:

a first datum plane positioned and oriented relative to a reference;

a second datum plane positioned and oriented relative to said reference; and

a third datum plane positioned and oriented relative to said reference.

Claim 33. The model of Claim 32 wherein said first datum plane, said second datum plane, and said third datum plane are orthogonal.

Claim 34. The model of Claim 21 wherein said reference feature comprises at least one of said coordinate system, another coordinate system, a point, line curve, surface, and datum plane.

Claim 35. The system of Claim 21 wherein said restructuring each dependency for each said feature includes:

a dependency established for each said feature for placement includes establishing an associative relationship with said reference feature to control placement of each said feature;

a dependency established dependency for each said feature for positioning includes establishing another associative relationship with said another reference feature to control positioning of each said feature; and

deletion of any existing associative relationships to said at least one of said parent modeling element and a child thereof.

Claim 36. The system of Claim 35 wherein at least one of said associative relationship and said another associative relationship is a parent/child relationship.

Claim 37. The system of Claim 21 wherein said restructuring each dependency for each said feature for placement further includes:

if said feature is dependent on an existing datum for placement; then at least one of:

a new reference feature is configuring for placement of said feature wherein said reference feature is a descendent of a parent coordinate system and establishing an associative relationship between said feature and said new reference feature, then deleting said dependency,

said existing datum is reconfigured as a descendant of said parent coordinate system; and

an associative relationship is established with at least one of said parent coordinate system and a descendent reference feature therefrom and deleting said dependency.

Claim 38. The system of Claim 37 wherein said associative relationship is a parent/child relationship.

Claim 39. The system of Claim 21 wherein said restructuring each dependency for each said feature for positioning further includes:

if said feature is dependent on said at least one existing datum for positioning, then at least one of:

a new reference feature is configured for positioning of said feature wherein said reference feature is a descendent of a parent coordinate system and establishing an associative relationship between said feature and said new reference feature, then deleting said dependency,

said at least one existing datum is reconfigured as a descendant of said parent coordinate system;

an associative relationship is established with at least one of said parent coordinate system and a descendent reference feature therefrom and deleting said dependency.

Claim 40. The system of Claim 39 wherein said associative relationship is a parent/child relationship.

Claim 41. The system of Claim 21 wherein none of said features exhibits an associative relationship with any other feature.

Claim 42. The system of Claim 21 wherein none of said features exhibits an associative relationship with said base feature.

Claim 43. The system of Claim 21 wherein said base feature exhibits an associative relationship with at least one of said coordinate system and a descendent thereof.

Claim 44. The system of Claim 21 wherein a descendent of said coordinate system includes at least one of a reference, point, line, datum plane and another coordinate system positioned and oriented relative to said coordinate system.

Claim 45. A storage medium encoded with a machine-readable computer program code, wherein said storage medium includes instructions for causing a computer to implement a method for converting a vertically structured CAD/CAM model to a horizontally structured CAD/CAM model comprising:

identifying and establishing a base feature;

establishing a parent coordinate system;

identifying a parent modeling element;

identifying each dependency for each feature from said parent modeling element;

restructuring each dependency for each said feature for placement, such that each feature exhibits a direct associative relationship with a reference feature; and

restructuring each dependency for each said feature for positioning, such that each feature exhibits a direct associative relationship with another reference feature.

Claim 46. A computer data signal embodied in a computer readable medium:

wherein said computer data signal comprises code configured to cause a computer to implement a method for converting a vertically structured CAD/CAM model to a horizontally structured CAD/CAM model comprising:

identifying and establishing a base feature;

establishing a parent coordinate system;

identifying a parent modeling element;

identifying each dependency for each feature from said parent modeling element;

restructuring each dependency for each said feature for placement, such that each feature exhibits a direct associative relationship with a reference feature; and

restructuring each dependency for each said feature for positioning, such that each feature exhibits a direct associative relationship with another reference feature.